



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/577,034	01/23/2007	Kwang-Soon Kim	123054-06053473	9121
22429	7590	11/10/2009	EXAMINER	
LOWE HAUPTMAN HAM & BERNER, LLP			SEKUL, MARIA LYNN	
1700 DIAGONAL ROAD			ART UNIT	PAPER NUMBER
SUITE 300			2461	
ALEXANDRIA, VA 22314				
		MAIL DATE		DELIVERY MODE
		11/10/2009		PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/577,034	KIM ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	MARIA L. SEKUL	2461	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 18 March 2009.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-31 is/are pending in the application.  
 4a) Of the above claim(s) 11-25 and 27-31 is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-6, 9, 10 and 26 is/are rejected.  
 7) Claim(s) 7 and 8 is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 24 April 2006 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____ .
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)	5) <input type="checkbox"/> Notice of Informal Patent Application
Paper No(s)/Mail Date _____.	6) <input type="checkbox"/> Other: _____ .

## DETAILED ACTION

### ***Response to Arguments***

1. Applicant's arguments with respect to **claims 1, 2 and 10** have been considered but are moot in view of the new ground(s) of rejection.
2. Applicant's arguments with respect to **claim 3** have been considered but are moot in view of the new ground(s) of rejection applying **Smee et al. (US PGPub 2004/0131007)** (hereinafter Smee) to base claim 1. Examiner has also noted Applicant's remark regarding the cite to Kleider in claim 3 and has made appropriate correction to reference paragraph bridging columns 5-6 (rather than columns 6-7).

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
4. **Claims 6 and 8** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

As to claim **6**, this is an amended claim. The amended claim language recites "a remaining number of said pilot subcarriers are allocated". This claim language replaces the prior claim language which stated the limitation "as to insufficient pilot subcarriers"

(and which also reflects the language of the Specification which has not been amended).

Referring to Applicant's Specification (p. 5, lines 1-7; or Para [0014] of the PG Publication), "as to insufficient pilot subcarriers . . . part of the proper pilot subcarriers are allocated to the cells which have the same position in different groups". This language is interpreted by Examiner to mean that if there are not enough, i.e. insufficient, subcarriers, subcarriers from a proper set are allocated to cells that occupy the same position in a different cell group.

The new claim language, however, states "a remaining number of pilot subcarriers" which means there are available unassigned pilot subcarriers that have not been assigned, that is, the subcarriers are not "part of the proper subcarriers". Again referring to the Specification, the "proper pilot subcarriers" are determined by dividing the number of subcarriers by the number of cells. No reference is made to the remainder of the subcarriers, only to the assigning of "proper pilot subcarriers". Therefore, there is no support found in the Specification for this limitation.

As to claim 8, this is an amended claim. The new claim language recites "the pilot subcarriers are not punctured and transmitted at a position other than the position of subcarriers used for transmission to the mobile station". There is lack of support in the Specification for this limitation.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. **Claims 8 and 9** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to **claim 8**, the claim language recites "the pilot subcarriers are not punctured and transmitted at a position other than the position of subcarriers used for transmission to the mobile station". It is unclear whether this means "not punctured or transmitted" or "not punctured, and transmitted".

As to **claim 9**, line 3-4 recite the limitation "the frame". There is insufficient antecedent basis for this limitation in the claim.

#### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. **Claims 1 and 2** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Li et al. (US PGPub US 2002/0159422)** (hereinafter Li), and further in view of **Smee et al. (US PGPub 2004/0131007)** (hereinafter Smee).

As to **Claim 1**, Li discloses a method to be used in "an orthogonal frequency division multiplexing access-frequency division duplexing (OFDMA-FDD) mobile communications system" (Li discloses a system with an OFDM transmitter for generating OFDM signals in a wireless communications network where the system may be a FDD system (OFDM transmitter with frequency division duplexing (FDD) duplexer, **Fig. 3, ¶ 45-46**; downlink and uplink transmission is arranged through FDD, (**¶ 75**); and "(a) configuring a downlink frame with a plurality of symbols" (transmitter using OFDM for downlink communications; **Fig. 4 (¶ 50)**; the transmission is made up of symbols generated by performing the encoding process ; **¶ 52**).

and "a part of pilot subcarriers being reference for a mobile station to perform time synchronization, frequency synchronization [ ]" (pilot symbols can serve multiple purposes: time and frequency synchronization, channel estimation and SINR ratio measurement, **¶ 82**).

Li does not explicitly disclose "(b) for each symbol, allocating a plurality of traffic subcarriers and a plurality of pilot subcarriers distributed with respect to both time and frequency".

Smee teaches pilot subbands are distributed with respect to time and frequency, and data may be transmitted on the other set of subbands not designated for pilot transmission, **Figs 6A and 6B, ¶ 91-93**.

Li does not explicitly disclose that the pilot subcarriers are used for "cell search".

Smee further teaches that the terminal must perform a search for the pilot signals when transmission of the pilot signals is not synchronized among cells, **¶ 94**).

Smee and Li are analogous in the art because they pertain to the allocation of pilot subcarriers in an OFDM system. It would have been obvious to one skilled in the art at the time the invention was made to use the subcarriers not allocated for pilot transmission to be used for data transmission in order to benefit from the entire frequency band.

As to **Claim 2**, Li discloses a method for configuring a downlink signal in an orthogonal frequency division multiplexing access-time division duplexing (OFDMA-TDD) mobile communication system" (Li discloses a system with an OFDM transmitter to generate OFDM signals using a time switch for time division duplexing (TDD) duplexer, **Fig. 3, ¶ 45-46**); comprising:

"(a) configuring a downlink frame with a plurality of symbols"(the transmission is made up of symbols generated by performing the encoding process ; **¶ 52**), "the downlink frame and a seamless uplink frame forming a frame of the mobile

communication system (TDD supports full duplex communication, or other systems in which communication in both directions is in the same frequency, ¶ 45; and the downlink and uplink transmission is arranged through TDD, ¶ 75); and

“a part of said pilot subcarriers being reference for a mobile station to perform time synchronization, frequency synchronization [ ] ” (pilot symbols can serve multiple purposes: time and frequency synchronization, channel estimation and SINR ratio measurement, ¶ 82).

Li does not explicitly disclose "(b) for each symbol, allocating a plurality of traffic subcarriers and a plurality of pilot subcarriers distributed with respect to both time and frequency".

Smee teaches pilot subbands are distributed with respect to time and frequency, and data may be transmitted on the other set of subbands not designated for pilot transmission, **Figs 6A and 6B, ¶ 91-93**).

Li does not explicitly disclose that the pilot subcarriers are used for “cell search”.

Smee further teaches that the terminal must perform a search for the pilot signals when transmission of the pilot signals is not synchronized between cells, ¶ 94).

Smee and Li are analogous in the art because they pertain to the allocation of pilot subcarriers in an OFDM system. It would have been obvious to one skilled in the art at the time the invention was made to use the subcarriers not allocated for pilot transmission to be used for data transmission in order to benefit from the entire frequency band.

9. **Claims 3 and 26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Li et al. (US PGPub US 2002/0159422)** (hereinafter Li) in view of **Smee et al. (US PGPub 2004/0131007)** (hereinafter Smee), as applied in claim 1, and further in view of **Kleider et al. (US 6,487,252)** (hereinafter Kleider).

As to **Claims 3 and 26**, Li in view of Smee discloses all of claim 1 and 2, respectively.

Li further discloses that “the pilot subcarriers are distributed at regular intervals with respect to time” (pilot symbols have a fixed duration followed by a fixed number of data periods, ¶ 42).

Li in view of Smee does not disclose pilot symbols are “distributed at irregular intervals with respect to frequency domain”.

Kleider teaches unequal spacing of the pilot tones with respect to frequency in an OFDM system (**col. 5, line 59 through col. 6, line 7**).

Kleider and Li in view of Smee are analogous art in that they pertain to assigning pilot signals in OFDM systems. It would have been obvious to one skilled in the art at the time the invention was made to use the method of assigning pilots unevenly with respect to frequency with the method of equal spacing as to time as taught by Li in view of Smee being that, according to Kleider, (col. 3, line 65 through col. 4, line 7), the less pilots that are used the more the spacing is uneven, and less pilot tones may be a result of improved signal to noise ratio or reduced bit error rate.

10. **Claims 4-6** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Li et al. (US PGPub US 2002/0159422)** (hereinafter Li) in view of **Smee et al. (US PGPub**

**2004/0131007)** (hereinafter Smee) in view of **Kleider et al. (US 6,487,252)**, and further in view of **Baum et al. (US Patent 5,867,478)** (hereinafter Baum).

As to **Claim 4**, Baum discloses “system comprises a plurality of cells” (**Fig. 3**) and “wherein the pilot subcarriers are allocated to the cells according to proper position sets of pilot subcarriers so that the pilot subcarriers in adjacent cells are not superimposed”. Baum describes a pilot codes are inserted according to the pilot codes allocated to the cells (**Fig. 3; col. 6, lines 39-45**).

Baum and Li in view of Smee in view of Kleider are analogous art in that they pertain to assigning pilot codes in an OFDM system. It would have been obvious to one skilled in the art at the time the invention was made to use the pilot allocation mechanisms in Baum with the pilot usage in Li in view of Smee in view of Kleider in order to maintain orthogonality and avoid code collisions, as described in Kleider, col. 7, lines 18-20.

As to **Claim 5**, Li in view of Smee in view of Kleider in view of Baum discloses all of claim 4.

Baum further discloses “when the number of cells is greater than an available number of the proper position sets, the pilot subcarriers are allocated so as to minimize a number of pilot subcarriers that are superimposed in non-adjacent cells”.

Baum discloses allocation of pilot codes in cells (Fig. 3) in which pilot codes are assigned to cells, and a re-use scheme in which pilot codes can be re-used in sectors which are not in adjacent cells. The pilot code reuse means the pilot code length does not need to be as large as the number of cells in the system (col. 6, lines 44-58).

As to **claim 6**, Li in view of Smee in view of Kleider in view of Baum discloses all of claim 4.

Smee further discloses "the cells are divided into groups of cells" (**Fig. 5**):

"a predetermined number of said pilot subcarriers are allocated for each cell, said predetermined number being generated by dividing the number of subcarriers by the number of cells".

Smee teaches predetermining the number of pilots by partitioning the usable subbands (subcarriers) for pilot transmission where the number of usable subbands is divided into groups or sets which are allocated to different sectors/cells (**Fig. 2A-2B, ¶ 44-49**), and the number of sets to form depends on the size of the cluster (number of cells) for which frequency orthogonality is desired (**Fig. 3A, ¶ 55-56**).

Smee also teaches "a remaining number of said pilot subcarriers are allocated to the cells which have the same position in different groups to configure a position set of pilot subcarriers for each cell and said predetermined number and remaining number of said pilot subcarriers together configure a proper position set of the pilot subcarriers for each cell". Fig. 5 teaches that the total number of cells is divided into cell groups (see the shaded area of Fig. 5) and that the allocated pilots are reused in the other cell groups in the same positions.

11. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Li et al. (US PGPub US 2002/0159422)** in view of **Smee et al. (US PGPub 2004/0131007)** (hereinafter Smee), as applied to claim 2 above, in view of **Baum et al. (US Patent 5,867,478)** (hereinafter Baum).

As to **Claim 9**, Li in view of Smee discloses all of claim 2.

Li in view of Smee does not explicitly disclose “wherein a position set of the pilot subcarriers allocated to the downlink frame is established to be different from a position set of pilot subcarriers allocated to the frame in order to identify the downlink frame and the frame”.

Baum teaches a different pilot code scheme can be used for uplink transmission than the pilot code scheme for downlink transmission (**col. 22, lines 51-54**).

Baum and Li in view of Smee are analogous art in that they both deal with generating OFDM downlink signals and pilot code usage in a network system. It would have been obvious to one skilled in the art at the time the invention was made to use different pilot code sequence in the uplink transmission different from the downlink reception in order to distinguish which the uplink and downlink portions of the frame.

12. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Dubuc et al. (US Patent No. 7,251,291)** (hereinafter Dubuc) in view of **Smee et al. (US PGPub 2004/0131007)** (hereinafter Smee).

As to **claim 10**, Dubuc discloses:

“a pilot generator for generating a pilot symbol pattern” (**Fig. 2** shows a pilot signal generator), and

“a symbol mapper for mapping external input traffic data information with respect to time and frequency based on the pilot symbol pattern and the position set pattern of pilot subcarriers generated by the pilot generator” (**Fig. 2** shows the generated pilot

being input to a symbol mapper 204 which is then input into the time and frequency converter), and

“the pilot symbol pattern defining symbols of a downlink frame” and “including [ ] a plurality of traffic subcarriers, and a plurality of pilot subcarriers which are distributively arranged with respect to both time and frequency for each symbol” (**Figs. 2 and 3** shows data signals generated by Data Signal Generator 202 and pilot symbols generated by Pilot Signal Generator 206 being mapped into symbols and arranged with respect to time and frequency for each symbol by the Frequency to Time Domain Converter 210; **Fig. 7** shows OFDM frames made up of symbols, including pilot symbols);

“outputting mapped signals to a transmitter of the mobile communication system” (**Fig. 2** shows the mapped signal being sent to the transmitter interface 113A); and the pilot signals “are references for a mobile station to perform time synchronization, frequency synchronization, [ ]” (**Fig. 4** shows a receiver using the pilot to perform channel estimation 428 and synchronization 426 with the cell).

Dubuc does not explicitly disclose the pilot symbol pattern is “according to external cell number information and a position set pattern of pilot subcarriers” and “the position set pattern of pilot subcarriers being proper to each cell”.

Smee teaches the pilot allocation scheme in which a set of pilots for each cell are predetermined and are assigned (“proper”) to cells (**Fig. 2B, ¶ 46-49; Fig 3A, ¶ 56**). The allocation of pilot signals may be used by the pilot generator described in Dubuc.

Dubuc does not explicitly teach the pilot signals are references for “cell search”.

Smee further teaches that the terminal must perform a search for the pilot signals when transmission of the pilot signals is not synchronized among cells, ¶ 94).

Smee and Dubuc are analogous art in that they both deal with pilot generation and allocation. It would have been obvious to one skilled in the art at the time the invention was made to combine the pilot allocation method in Smee with the pilot generation method in Dubuc in order for the pilot generator to know which pilot signals to generate for that cell and for the user to know which pilot signals belong to the cell.

***Allowable Subject Matter***

13. **Claims 7 and 8** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARIA L. SEKUL whose telephone number is (571)270-7636. The examiner can normally be reached on Monday - Friday 9:00-5:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (571) 272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MARIA L. SEKUL  
Examiner  
Art Unit 2461

/M. L. S./  
Examiner, Art Unit 2461

/Huy D Vu/  
Supervisory Patent Examiner, Art Unit 2461